THEORY OF COMPUTATION

(Context Free Languages, Push-Down Automata)

1. A PDA behaves like an FSA when the number of auxiliary memory it has, is

2. The statement "A TM" can't solve halting problem" is

(a) True
(b) False
(c) Still an open question
(d) False when P!= NP

3. Suppose Smita is able to solve an NP-complete problem in polynomial time on a deterministic Turing machine, then what we can deduct from that?

(a) P = CO-NP (complement of NP)
(b) P = NP
(c) P ≠ NP
(d) None of these

4. Consider PDA = M = $(\{q_0, q_1\}, \{a, b\}, \{a, z_0\}, \delta, q_0, z_0, \varphi)$ which accepts by empty stack

δ: $(q_0, a, z_0) = (q_0, az_0)$
$(q_0, a, a) = (q_0, aa)$
$(q_0, b, a) = (q_1, a)$
$(q_1, b, a) = (q_1, a)$
$(q_1, a, a) = (q_1, \in)$
$(q_1, \in, z_0) = (q_1, \in)$

Which one of the following strings is accepted by the above PDA?

(s1) aaa
(s2) aabbaa
(s3) aba
(s4) aaab

(a) Only s2, s3 and s4
(b) Only s1
(c) Only s2 and s3
(d) Only s2

5. Which of the following is true for the following grammar?

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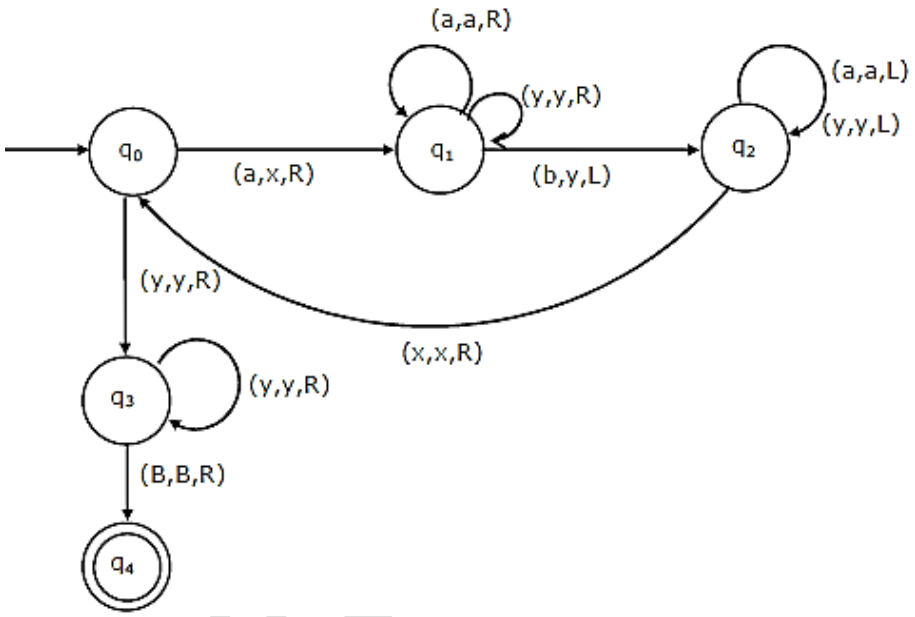
$E \rightarrow E + E$
$E \rightarrow E * E$
$E \rightarrow id$

(a) * has precedence over +
(b) + has precedence over *
(c) Both are of same precedence
(d) None of these

6. The transition table table for Turing machine is given below:



Which one of the following strings is accepted by the above TM?

(a) aabbb
(b) aabb
(c) abbb
(d) None of these

7. Which of the following is TRUE?

(a) The equality problem ($L_1 = L_2$) of CFLs is decidable
(b) The emptiness of CSL's is decidable
(c) Finiteness of CFL is decidable
(d) Is $L_1 \cap L_2 = \phi$ is decidable for CSL's

8. Consider three decision problems P_1, P_2 and P_3. It is known that P_1 is decidable and P_2 is undecidable. Which one of the following is true?

(a) P_3 is decidable if P_1 is reducible to P_3
(b) P_3 is undecidable if P_3 is reducible to P_2
(c) P_3 is undecidable if P_2 is reducible to P_3
(d) P_3 is decidable if P_3 is reducible to P_2's complement

9. Consider the following grammar:

$S \rightarrow Aa \mid b$
$A \rightarrow Ac \mid Sd \mid c$

The resulting grammar after eliminating left recursion is

(a) $S \rightarrow Aa \mid b$
$A \rightarrow SdA' \mid CA'$
$A' \rightarrow cA' \mid \epsilon$

(b) $S \rightarrow Aa \mid b$
$A \rightarrow bdA' \mid cA'$
$A' \rightarrow cA' \mid adA' \mid bA' \mid \epsilon$

(c) $S \rightarrow Aa \mid b$
$A \rightarrow bdA' \mid cA'$
$A' \rightarrow cA' \mid adA' \mid \epsilon$

(d) None of these

10. Consider the following languages:

$L_{ne} = \{\langle M \rangle \mid L(M) \neq \phi\}$
$L_e = \{\langle M \rangle \mid L(M) = \phi\}$

where $\langle M \rangle$ denotes encoding of a Turning machine M

Then which one of the following is true?

(a) L_{ne} is r.e. but not recursive and L_e is not r.e.
(b) Both are not r.e.
(c) Both are recursive
(d) L_e is r.e. but not recursive and L_{ne} is not r.e.

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